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VELONEX

VELONEX
INSTRUCTION
MANUAL
MODEL V-3050

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Serial # 16673

All information contained herein is believed to be accurate and correct. However, no responsibility for errors, omissions or any problem arising by the use of this material is assumed by Velonex.

WARNING

The Model V-3050 Voltage and Current Surge Generator contains voltages which could be dangerous if contacted. All reasonable safety precautions have been taken in the design and manufacture of this instrument. DO NOT attempt to defeat the protection provided.

Power should be removed and high voltage capacitors should be discharged prior to any maintenance work.

Only recommended replacement parts should be used.

The Model V-3050 should be operated and maintained only by personnel qualified to work with high voltage equipment.

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Model V-3050 Surge Coupler/Isolation Filter
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Claim For Damage in Shipment

This instrument should be tested as soon as possible after receipt. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent and this report should be forwarded to Velonex. We will then advise you of the disposition to be made of the equipment and arrange for repair or replacement. Include model number and serial number when referring to this instrument for any reason.

Warranty

Velonex warrants each instrument manufactured by us to be free from defects in material and workmanship. Our liability under this warranty is limited to servicing or adjusting any instrument returned to the factory for that purpose and to replace any defective parts thereof. This warranty is effective for one year after delivery to the original purchaser when the instrument is returned, transportation charges prepaid by the original purchaser, and when upon our examination, it is disclosed to our satisfaction to be defective. If the fault has been caused by misuse or abnormal conditions or operation, repairs will be billed at cost. In this case, an estimate will be submitted before the work is started.

If any fault develops, the following steps should be taken:

1. Notify us, giving full details of the difficulty and include the model number and serial number. On receipt of this information, we will give you service data or shipping instructions.

2. On receipt of shipping instructions, forward the instrument prepaid to the factory. If requested, an estimate of the charges will be made before work begins provided the instrument is not covered by the warranty.

Shipping

All shipments of Velonex instruments should be made via Air or Truck if shipping distance is under 300 miles. The instrument(s) should be either repacked in the original shipping container or packed in a strong exterior container and surrounded by at least three inches of excelsior or similar shock absorbing material.

Proprietary Notice

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Section 1
General Description

The Model V-3050 three-phase isolation unit allows surge testing of devices or equipment connected to active three- phase as well as single phase power lines. The surge coupler/isolation network will protect the power line from undesirable back surges without loading the surge generator output. The Model V-3050 is used in conjunction with the Velonex Models 587P or 590P Voltage and Current Surge Generators to form a complete surge testing system.

The Model V-3050 allows for ten different surge injection methods, consisting of four normal mode and six common mode tests (see Figure 1). Polarity selection is standard, allowing for comprehensive testing of equipment under all line surge conditions.

The system consists of two parts: A control unit providing surge coupling selection, polarity control and system status indicators, and a filter unit for connecting the equipment under test (E.U.T.). The filter unit accepts a full line of NEMA three-phase receptacles as plug-in units. ** Also provided is a differential high voltage attenuator to allow direct connection of an oscilloscope for monitoring surge events.

The Model V-3050 is intended primarily to operate with three-phase AC power lines but can also be used on many single-phase systems. Application is limited to 277/480V WYE Y maximum, or up to 250V DELTA $\triangle$, including DC when fitted with option "D".

SPECIFICATIONS:

Surge Voltage:	Up to 6kV of isolation and attenuation from a "6kV, 100kHz" oscillatory wavefrom or a "6kV, 1.2x50μs/3kA, 8x20μs" combination wave. *
Surge Current:	Up to 3kA peak current isolation and attenuation for the "3kA, 8x20us" combination wave. *
Line Sync:	Surges can be synchronized to either of three phases in "$\triangle$" or "Y" configurations.
AC Line Voltage:	Maximum line voltage to load, 480V RMS, 50/60Hz phase to phase and 277V per phase to neutral (Y only). Up to 250V $\triangle$. Up to 277v per single phase.
DC Voltage:opt."D"	Maximum voltage to load 100V DC supplied only between phase 1, 2, 3 and N to ground on common mode only. Make sure normal mode is set to "OFF" position

* Voltage and current waveforms defined in IEEE/ANSI C62.41-1991
** Ask for Technical Note 125

Specifications - (Cont'd)

AC Line Current:	Maximum continuous current to load 25A RMS per phase, maximum intermittent loading of 30A per phase.
DC Current: Opt."D"	Maximum continuous DC current to load 20A.
Isolation Filter Losses:	When operating loads close to the above specified current limits, a voltage drop of less then 10% can be expected at the load. An additional 7.5A of capacitive current per phase will be required when operating at 277VRMS per phase with proportionally less at lower voltages.
Physical Description:	The surge input signal is coupled from the Model 587P or 590P, via a high voltage cable to the rear of the V-3050 control unit. The control unit provides three switches for controlling surge polarity and coupling configuration. Also provided is a series of L.E.D. annunciators showing the interlock and ready status of the system. The control unit feeds the surge signal to the filter unit which combines the surge and three-phase power. The filter section has a plug-in cavity for accepting different types of modules with a variety of available receptacles for power plus surge output to the E.U.T. Three-phase power is provided to the filter from a removeable standard power cable. Together, the Model 587P or 590P,and the V-3050 control and filter units form a versatile surge testing system.
Safety Features :	The Model V-3050 Surge Coupler/Isolation Unit employes an active digital interlock system for operator protection. L.E.D. annunciators tell the status of any interlock. If an interlock opens, the automatic shut-down of the surge and three-phase power follows. High voltage shielded cables are used to couple surge signals between system units for operator safety. Circuit breaker protection is employed for all three-phase power to the E.U.T.

Specifications - (Cont'd)

Input Power: The control and filter units each require 115V or 230V, ±10%, 50/60Hz. Power consumption is approximately 50 watts each.

Physical Dimensions (including cabinet)

Control Unit:

Width	19 3/4 inches	50.17 cm
Depth (Exclusive of front and rear projections)	21 1/2 inches	54.16 cm
Height	7 1/2 inches	19.05 cm
Weight	68 pounds	30.90 kg
Weight, Rack Mount	42 pounds	19.09 kg

Filter Unit:

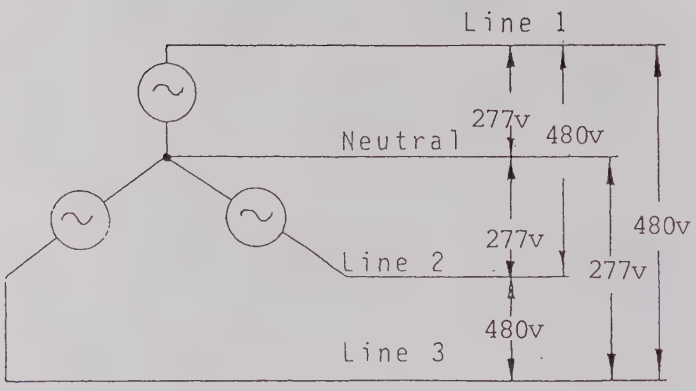
Width	19 3/4 inches	50.17 cm
Depth, (Exclusive of front and rear projections)	21 1/2 inches	54.16 cm
Height	7 1/2 inches	19.05 cm
Weight	110 pounds	50.00 kg
Weight, Rack Mount	85 pounds	38.64 kg

1.3 Table 1, Standard Coupling Modes:

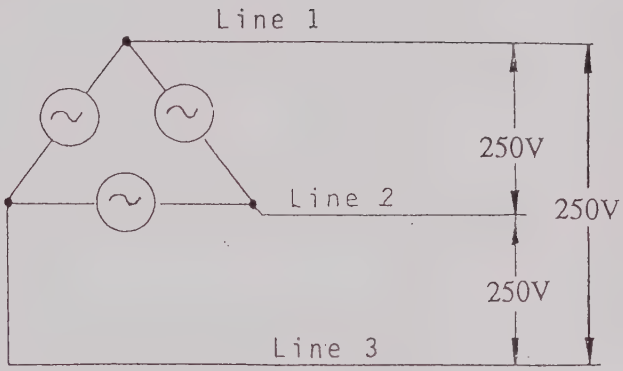
Test Type	Line 1	Line 2	Line 3	Neutral	Ground
NORMAL MODE	HIGH	LOW			
		HIGH	LOW		
	HIGH		LOW		
	HIGH	HIGH	HIGH	LOW	
COMMON MODE	HIGH				LOW
		HIGH			LOW
			HIGH		LOW
				HIGH	LOW
	HIGH	HIGH	HIGH		LOW
	HIGH	HIGH	HIGH	HIGH	LOW

* Shown with positive surge polarity. Negative surge polarity reverses the low and high connections above.

1.4 FIGURE 1, Typical three-phase power lines:



Typical 3 Phase "Y"
4 Pole, 5-wire Grounded



Typical 3 Phase "△"
3 Pole, 4-wire Grounded

Section 2
Operating Instructions

2.1 Power On Push Button:

Controls all instrument power to the V-3050. Pressing the Power push button provides for turning the instrument on or off.

2.2 Line Sync. Source Select:

Surges can be synchronized with respect to any of the 3 phases of the line available via rear panel switch S205. There are 3 selections available for "/\" and "Y" configurations.

X-->N, Y-->N and Z-->N are available for "Y" configuration and X-->Y, Y-->Z and Z-->X are available for "/\" configuration. For Single Phase application, use one of the "Y" configuration settings making sure line signal is connected to the same phase.

CAUTION: Using "/\" configuration positions for "Y" and vise versa may cause damage to unit.

2.3 Normal Mode Select Switch:

CAUTION: Changing injection modes while the high voltage is on will cause an automatic high voltage shut down of the 587P surge generator. A surge can be generated when this occurs. Always turn off high voltage before changing the Injection Mode Switch settings.

The Normal Mode Select Switch provides for selecting one of four modes of injecting the surge onto the Equipment Under Test (E.U.T.) power line. See Table 1 for a summary of the different types of normal (transverse) injection modes.

2.4 Common Mode Select Switch:

CAUTION: Changing injection modes while the high voltage is on will cause an automatic high voltage shut down of the 587Psurge generator. A surge can be generated when this occurs. Always turn off high voltage before changing the Injection Mode Switch settings.

The Common Mode Select Switch provides for selecting one of seven modes of injecting the surge onto the (E.U.T.) power line. See Table 1 for a summary of the different types of common injection modes.

2.5 AC/DC Select Key Switch (Option "D" only)

When the key is in the vertical position, the V-3050 is in AC mode, and when the key is in horizontal position, V-3050 is in DC mode.

2.6 Polarity Select Switch:

CAUTION: Changing polarity while the high voltage is on will cause an automatic high voltage shut down of the 587P surge generator. A surge can be generated when this occurs. Always turn of high voltage before changing the polarity setting.

The Polarity Select Switch provides for selecting a positive or negative surge to be injected on the E.U.T. power line.

2.7 Interlock LED's:

Because of the high voltages present within the V-3050 a series of interlocks are employed to shut all or part of the instrument down in the advent of an interlock opening. Eight blinking yellow LED's indicate the status of each interlock. When any interlock opens the surge generator will shut down the high voltage. Once the interlock is closed the high voltage can be turned on again. A green LED indicates when all interlocks are closed and the unit is ready for test. The following describes each interlock LED.

1. Line Not Detected: This interlock indicates the V-3050 is not connected to a powered AC line. The line for the E.U.T. must be plugged in at rear connector J202 because during a line surge the filter, in part, requires the low impedance of the line to help attenuate the surge. If the female plug is not connected and someone was to touch the ends during a surge, they could be hurt. Source for line detect is selected using switch S205.

2. Control Switch Not Positioned: This interlock is active when either the injection mode select or polarity switches are changed. To prevent any surge from occurring during an injection mode or polarity change the V-3050 will signal the surge generator to shut down the high voltage. The surge generator will require its high voltage to be turned on again after the injection mode or polarity change is complete. The AC power to the E.U.T. is not effected during a mode change.

3. Plug J201 Disconnected: This interlock indicates the high voltage plug J201 retaining screw, located on the rear of the V-3050 Control Unit, is not fully home.

4. Plug J202 Disconnected: This interlock indicates the high voltage plug J202 retaining screw, located on the rear of the V-3050 Control Unit, is not fully home.

5. Plug J1202 Disconnected: This interlock indicates the high voltage plug J1202 retaining screw, located on the rear of the V-3050 Isolation Network, is not fully home.

6. Plug-in disconnected: This interlock indicates if the plug-in module on the Isolation Network is not installed or fully seated.

7. Isolation Network Overload: This interlock indicates the E.U.T. has been drawing excessive current for to long a time and the internal inductors are over- heating. Once this interlock has opened, all line power and the surge to the E.U.T. is shut down. The thermal switch will re-close once the inductors have cooled down to less then 160 degrees Fahrenheit.

8. Surge Generator Disconnected: This interlock indicates the surge generator is either off, disconnected or has an interlock open. This interlock will shut down all power to the E.U.T. when open.

2.8 Differential High Voltage Attenuators:

Two high voltage 1000:1 attenuators are provided to monitor the Line + Surge outputs to the E.U.T. Two standard BNC type connectors are provided for connection to an oscilloscope. Each attenuator can be switched to monitor any phase of the three phase line, neutral, or chassis ground. When monitoring any normal mode injection use both channels differentially into an oscilloscope (channel 1 - channel 2). When monitoring any Common Mode injection use either channel ground referenced to view the surge event. The High Voltage Attenuator is accurate to $\pm 3\%$.

2.9 Line Power Circuit Breakers:

The Line Power Circuit Breakers switch AC power to the E.U.T. and provide 30 Amps of circuit protection. A red LED located above the circuit breakers will light when line power is applied to the Plug-in receptacle. Line power control by the Circuit Breakers will be over ridden by opening any interlock except for the control switch not positioned interlock.

See 2.5 for a detailed description of the V-3050 interlock system.

2.10 Surge + Line Plug-in:

The plug-in module provides a standard NEMA power receptacle for connecting the E.U.T. Two levers located on opposite sides of the gray cover allow the plug-in to be removed. Lift both levers to remove the plug-in. The plug-in must be seated fully for the plug-in interlock to be met.

CAUTION:Do not attempt to remove the plug-in when high voltage or line power is present.

Never try defeating the plug-in interlock.

Never attempt to connect an E.U.T. to the plug-in receptacle while the high voltage is on.

Velonex provides other standard NEMA power receptacle plug- ins. Do not try to replace the receptacle in the plug-in. Voltages greater then 6Kv are present during surging and can destroy some types of receptacles

2.11 Rear High Voltage Connector J201:

The V-3050 is connected to the surge generator via a high voltage cable assembly. The rear high voltage connector J201 accepts the male end of the high voltage cable. The high voltage plug retaining screw must be fully seated for the system interlock to be complete.

CAUTION: Do not attempt to remove the high voltage plug from either the surge generator or V-3050 with the high voltage or line power on.

2.12 Rear High Voltage Connectors J202 and J1202:

The Control and Isolation Network units comprising the V- 3050 are interconnected via a high voltage cable assembly from J202 on the Control unit to J1202 on the Isolation unit. The high voltage plug retaining screws on each plug must be fully seated for J202 and J1202 interlocks to be met.

CAUTION: Do not attempt to remove the high voltage plugs from either the Control or Isolation Network units with the high voltage or line power on.

2.13 587 Control Interface Connector:

The 587P Control Interface Connector J203, provides interlock and control signals between the V-3050 and the 587P Surge Generator.J203 is a standard eight pin, female, MS type panel connector. The following describes the function of each pin:

Pins A and B - These two pins will internally short when the V-3050 has all interlocks closed and the "Green" LED is illuminated. These connect to the surge generator and act as a high voltage interlock. When a V-3050 interlock is open, Pins A and B are open preventing the surge generator from turning on high voltage.

Pins C and D - Not used.

Pins E and F - These two pins provide a low voltage AC signal to the 587P Surge Generator representative of the line signal the E.U.T. sees. This is to provide a reference signal to the Phase Control circuitry of the 587P.

Pin G - This pin is a 24-34 volt DC input to the V-3050 from the surge generator indicating all high voltage interlocks are closed and the 587P is powered up. This is the input signal to the V-3050 Surge Generator Disconnected interlock.

Pin H - This pin provides a system Ground.

2.14 V-3050 Control Interface Connectors:

The Control Interface Connectors J204 and J1201, provides interlock and control signals between the V-2950 Control Unit and Isolation Network. Standard ten pin, MS type panel connectors are used. The following describes the function of each pin:

Pin A - This pin connects the J1202 interlock from the Isolation Network unit to the Control unit.

Pin B - This pin connects the Plug-in disconnected signal from the Isolation Network unit to the Control unit.

Pin C - This pin connects the thermal overload switch interlock in the Isolation Network unit with the Control Unit.

Pin D - This pin provides a 24-34 VDC source from the Control unit to the Isolation Network unit.

Pins E & F - These two pins provide an AC signal from Selected Phase in the Isolation Network unit to the Control unit. The signal is then routed internally to J203, the 587P Control Interface Connector.

Pin G - This pin provides a signal from the Control unit to the Isolation Network unit to turn the E.U.T. line power on or off.

Pin H - No connection.

Pin J - System ground.

Pin K - No connection.

2.15 Line Power Connector:

CAUTION: Never connect J1202 to a power source greater then 277 volts per phase or any combination with a potential greater then 480 volts RMS phase to phase. Severe damage to the instrument will occure.

The Line Power Connector J1202 provides power to the E.U.T. through the V-3050. The receptacle is a five contact twist lock rated at 277/480 VAC, 3 Phase Y, 30 Amps. Figure 6-7 illustrates the wiring connections used on the receptacle. Velonex supplies a mating plug for the receptacle. Exercise care in wiring it to the type of connector used for the required line. Always use a heavy gage wire (AWG 10 or larger) when operating above 15 Amps.

2.16 Fuse and Instrument Power Connector:

The Fuse and Instrument Power Connectors FL201 and FL1201 provide selectable power, 115/230 VAC, and integral line filtering for both the V-3050 Control and Isolation Units. An internal Slo-Blo 1 Amp fuse (1/2 Amp when operating at 230 VAC) protects each instrument. Standard instrument power cords are provided for connection to a 115 VAC, 60 Hz. line. The male end will be cut off at the factory for units destined for operation outside the United States and will require the customer to connect the appropriate male plug used locally.

2.17 General Operating Instructions:

1. Plug the AC power cord into a 115 VAC, ±10%, 50/60 Hz power source. If a 230 VAC power source is used, open the power line receptacle and change the voltage select drum to the 230 VAC position then close the cover.

2. Connect the high voltage cable between the V-3050 and 587P. Insure the retaining screws are fully in or an interlock will be open.

3. Connect the high voltage cable between the V-3050's Control Unit connector J202 and the Isolation Unit connector J1202. Insure the retaining screws are fully in or an interlock will be open.

4. Connect the control interface cable to J203 on the V-3050. Connect the other end to J201 on the 587P.

5. Connect the V-3050 control cable between the Control Unit J204 and Isolation Unit J1201.

6. Select Appropriate Line Sync. Source using S205.

7. Connect the appropriate line power to the twist lock connector J1204.

8. Plug the E.U.T. into the plug-in receptacle on the front of the Isolation Network unit.

9. Connect an oscilloscope to the differential high voltage attenuators on the front panel.

10. Press the Power On button to turn the V-3050 on.

11. Select the required injection mode and polarity.

12. Power up the 587P surge generator. Do not turn on the high voltage.

13. When all interlocks are closed and the green LED is on turn on the red circuit breakers to apply AC power to the E.U.T.

14. Turnon the high voltage on the 587P and begin surge testing the E.U.T.

15. Monitor the high voltage surges using an oscilloscope.

16. When testing is complete turn off the surge generators high voltage and power to the E.U.T. by flipping off the red circuit breakers. Turn off power to the V-3050.

Section 3
Circuit Descriptions

3.1 General Information:

The V-3050 employs high voltage switches for selecting the surge injection mode and polarity. Low level HCMOS logic circuitry controls the interlocks. The filter and coupling circuitry is proprietary and will not be discussed in detail as there are no user serviceable components.

3.2 Interlock Control Logic:

The Interlock Control Logic consists of eight interlock inputs to gate logic for turning on or off DIP relay K301. Relay K301 shorts or opens pins A and B of J203 which in turn is connected to the high voltage interlock on the 587 Surge Generator. The logic state for an interlock open is logic low. Each signal is fed into an OR gate, IC's Z307 and Z308, which are then ORed with a 1Hz clock signal from timer IC Z306. The output of each OR gate will pulse along with the clock when an interlock opens. The yellow LED's connected to each interlock output will blink as the output goes low. All but two of the interlock signals that go active low will also shut off AC power to the E.U.T. The Switch Not Positioned interlock and Line Not Detected will not shut down the AC power but will shut down the high voltage by opening Relay K301.

3.3 Opto Coupled Interlocks:

The V-3050 employs two sets of opto isolated interlocks. Each high voltage switch in the Control unit has attached to it an opto coupler switch that indicates when a switch is being turned. These consist of opto switches U401, U402, and U403. As the beam is interrupted by a switch turning the receiver quits conducting and the output goes high. The outputs of each receiver is pulled up by R413, R414, and R415.

The other set of opto isolated interlocks connect the Control unit logic circuitry with switches located in the Isolation unit. The opening of the J1202, Plug-in, or Thermal overload interlocks will transmit this to the Controller logic board via opto couplers U501 and U502.

3.4 Line Sync. Source Select:

Line Sync. Source Select Circuit consists of 2 parts. First part consists of three identical networks. These networks are used to keep a "Y" configuration 3 phase line balanced. When a phase is used for line sync., other two phases are loaded with dummy loads. The second part consists of a single load for "/\" configuration, as "/\" configuration does not care about load on individual phase loading.

3.5 Coupling and Filter Circuit:

The Coupling and Filter circuits contain no user serviceable parts and are proprietary. Schematics are provided for reference in case the problem is simple like a loose connection.

3.6 High Voltage Differential Attenuators:

Each High Voltage Attenuator consists of two switches connecting each BNC output to one of four resistor divider networks or ground. Each phase of the surge + line signal is connected through a network to provide an attenuation ratio of 1000:1 referenced to chassis ground. Each divider consists of five 50K ohm resistors in series along with a 49.9 ohm to ground. The attenuated signal is taken off of the 49.9 ohm.

3.7 DC Power Supplies:

The V-3050 incorporates three low voltage DC power supplies. An unregulated 24-34 Volt supply using T302 and CR303 is used for driving the three control relays in the Isolation unit. A regulated 24v power supply (Z310)power the indicator lamps in the Control unit. A filtered and fully regulated supply consisting of T301, CR302, R312, C302 and IC Z309 is located on the logic board and powers all circuitry on the board.

Section 4

Maintenance

4.1 Servicing:

Before attempting to service this instrument, study the circuit descriptions of Section 3.

4.2 Cooling:

The Model V-3050 utilizes forced air cooling in the Isolation Network unit and convection cooling in the Control unit. The vents in the rear of the Isolation Network units cabinet must be clear of obstructions. In rack mounted units avoid blocking the required airflow.

4.3 Cabinet Removal (Not applicable for rack mounted units):

Remove the four screws from the front panel (four on each side), and the four screws (two on each side) holding the rear mounting brackets to the chassis. Slide the instrument forward to clear the cabinet.

4.4 Top Cover Removal:

This is applicable for both the Control and Isolation units. Remove the eight flathead screws. Removal of the top cover opens interlock switch S201.

4.5 Bottom Cover Removal:

This is applicable for both the Control and Isolation units. Remove the eight flathead screws. Removal of the bottom cover opens interlock switch S202.

4.6 Cleaning:

Periodically inspect the instrument for dust accumulation. Clean with a vacuum cleaner or dry air under moderate pressure.

4.7 Panel Lights:

The Control units Power-On Panel Light is replaceable from the front panel by snapping out the translucent cover from each light. Chicago miniature number 327, 28 volt bulbs are used. As an additional safety feature, two lamps are connected in parallel in each indicator. Panel lamp replacement parts may be facilitated by the use of a lamp replacement tool (Microswitch type 15PA19 tool is recommended).

4.8 Opto Switch Adjustment:

Each high voltage switch has attached at the front end an aluminum bracket holding an opto switch. If the switch is not positioned, interlock is on continously, or the interlock fails to light when the switch is slowly turned, then the opto switch must be repositioned in its bracket. Loosening the allen setscrew and moving the opto switch in and out will set the actuation limit. The Control Switch Not Positioned LED indicator will show when the interlock is open.

4.9 Fuses:

The V-3050 Control and Isolation Network units each incorporate a combination line filter, power line select, and fuse unit. To remove the fuse use a flat blade screwdriver on the top of the unit to pry the plastic cover off. The fuse can now be removed. Should the fuse blow, remove the cause of failure and replace with the same type fuse. Use a 1 amp Slo-Blo fuse for 115 VAC lines and a 1/2 amp Slo-Blo for 230 VAC lines.

Section 5
Replaceable Parts List

The following lists the replaceable parts used in the Model V-3050SurgeCoupler/Isolation Filter. Circuit reference designations, where applicable, refer to the schematic diagrams in Section 6. Replacement parts should be ordered by specifying the entire Velonex part number.

5.1 Resistors:

Circuit Designation:	Description:	Velonex Part No.
R301	4.7, 1/2W, ±5%	091-0012.007
R302	4.7K, 1/4W, ±5%	091-0008.079
R303	4.3K, 1.4W, ±5%	091-0008.078
R304	680, 1/4W, ±5%	091-0008.059
R305, R310	100K, 1/4W, ±5%	091-0008.111
R306	3.9K, 1/4W, ±5%	091-0008.077
R307	10K, 1/4W, ±5%	091-0008.087
R308	3.3K, 1/4W, ±5%	091-0008.075
R309	47, 1/2W, ±5%	091-0012.031
R312-R313	4.7, 1W, ±5%	091-0016.007
R311	22K, 1/4W, ±5%	091-0008.095
R314, R315	100K, 1/4W, ±5%	091-0008.111
R316	10M, 1/4W, ±5%	091-0008.159
RP301-RP302	10K, 1/8W, ±2%	095-0088
R401-R409	100, 1/4W, ±5%	091-0008.039
R410-R412	220, 1/4W, ±5%	091-0008.047
R413-R415	4.7K, 1/4W, ±5%	091-0008.079
R501-R503	10K, 1/4W, ±5%	091-0008.087
R504-R506	2.2K, 1/2W, ±5%	091-0012.071
R801-R803	18K, 2W, ±5%	091-0020.093
R801-R803	6.8K, 2W, ±5%	091-0020.082 FOR OPT."D" ONLY
R805-R807	15K, 2W, ±5%	091-0020.091
R804	82K, 2W, ±5%	091-0020.109
R808	22K, 2W, ±5%	091-0020.095
R809	2.2K, 1W, ±5%	091-0016.071

Replaceable Parts List (Cont.)

Circuit Designation:	Description:	Velonex Part No.
RN105	Res. Network, Bleeder	900-19896
R1101	620, 1/4W, ±5%	091-0008.058
R1301-R1320	10K, 1/2W, ±1%	093-0003.337
R1321-R1324	49.9, 1/2W, ±1%	093-0002.001
R1901-R1903	25, 25W, ±5%	092-0088
RN1201-RN1204	Resistor Network Bleeder	900-19917
5.2 Capacitors:		
C201-C204	15uf, 7.5KV	106-0040
C301	22UF, 63VDC, ±10%	105-0108
C302, C308,	1000uf, 35VDC, ±10%	104-0006.39
C304-C306, C310	0.01uf, 50V	101-0066
C307	3.3uf, 15VDC	104-004.015
C309	10uf, 20V, 10%	104-0005.041
C311	1uf, 50V, Ceramic	101-0057
C801-C804	3uF, 440VAC	106-0063 FOR OPT. "D" ONLY
C1601-C1608	35uf, 440VAC, ±10%	106-0054
5.3 Diodes:		
CR301-CR303	Bridge Rectifier	111-0069
CR304-CR305	600V PIV, 1 Amp	111-0061
CR306-CR307	Zener, 3.9V	111-0170
CR401	LED, Green	111-0191
CR402-CR409	LED, Yellow	111-0192
CR801-CR804	Transzorb, 325V	111-0202
CR1101	LED, Red	111-0193

Replaceable Parts List (Cont.)

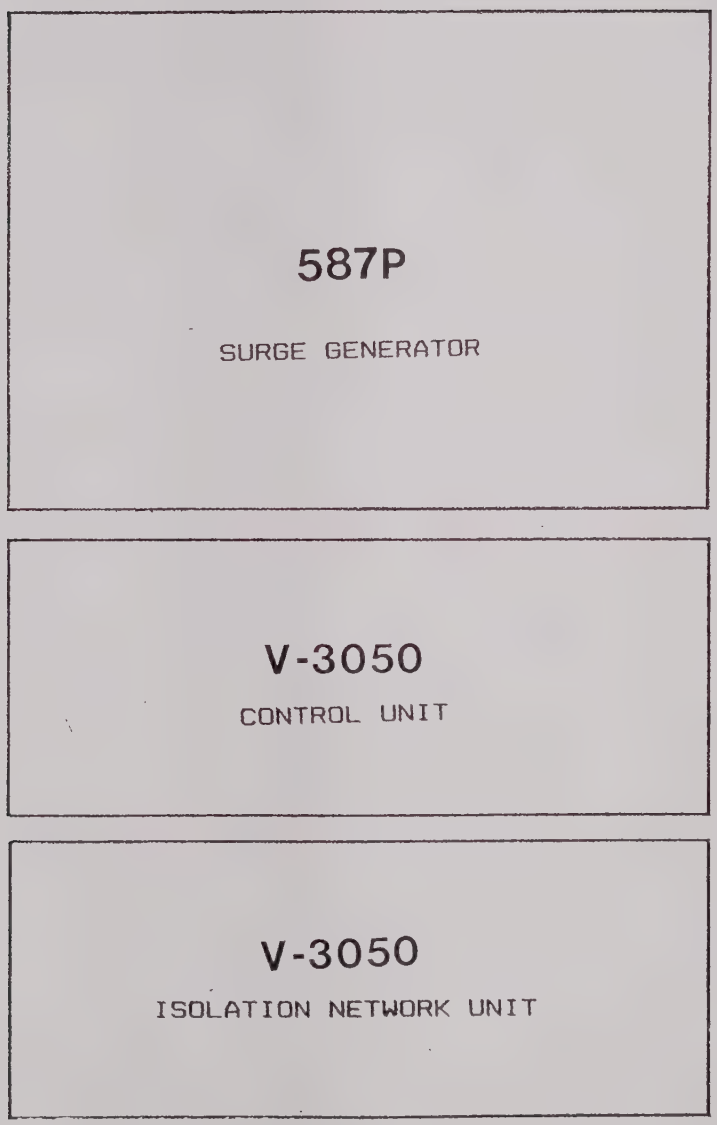
Circuit Designation:	Description:	Velonex Part No.
5.4 Transistors:		
Q301	40V, NPN	112-0001
5.5 Transformers:		
T301	110/220 Pri, 8/10 Sec, 4.5VA	142-0052
T302, T203	115/230 Pri, 12/24 Sec, 10.8VA	142-0053
T801-T804	115/230 Pri, 60/120 Sec, 1.1VA	142-0129
T1201	110/220 Pri, 110 Sec, 50VA	142-0119
T1501	110/220 Pri, 12/24 Sec, 4.5VA	142-0014
5.6 Panel Lamps:		
I101-I102	28V, 0.04A	280-0009
5.7 Integrated Circuits:		
Z301	Dual Four Input NAND	113-0103
Z302	Quad Dual Input & Gate	113-0095
Z303	Voltage Comparator	113-0097
Z304	Hex Inverter	113-0104
Z305	Dual Input NOR	113-0105
Z306	Dual Timer	113-0031
Z307-Z308	Quad Dual Input OR	113-0106
Z309	+5V, 1A Regulator	113-0017
Z310	+24V, 1A Regulator	113-0173
5.8 Opto-Couplers:		
U401-U403	Opto Switches	112-0136
U501-U502	Opto Couplers	113-0019

Replaceable Parts List (Cont)

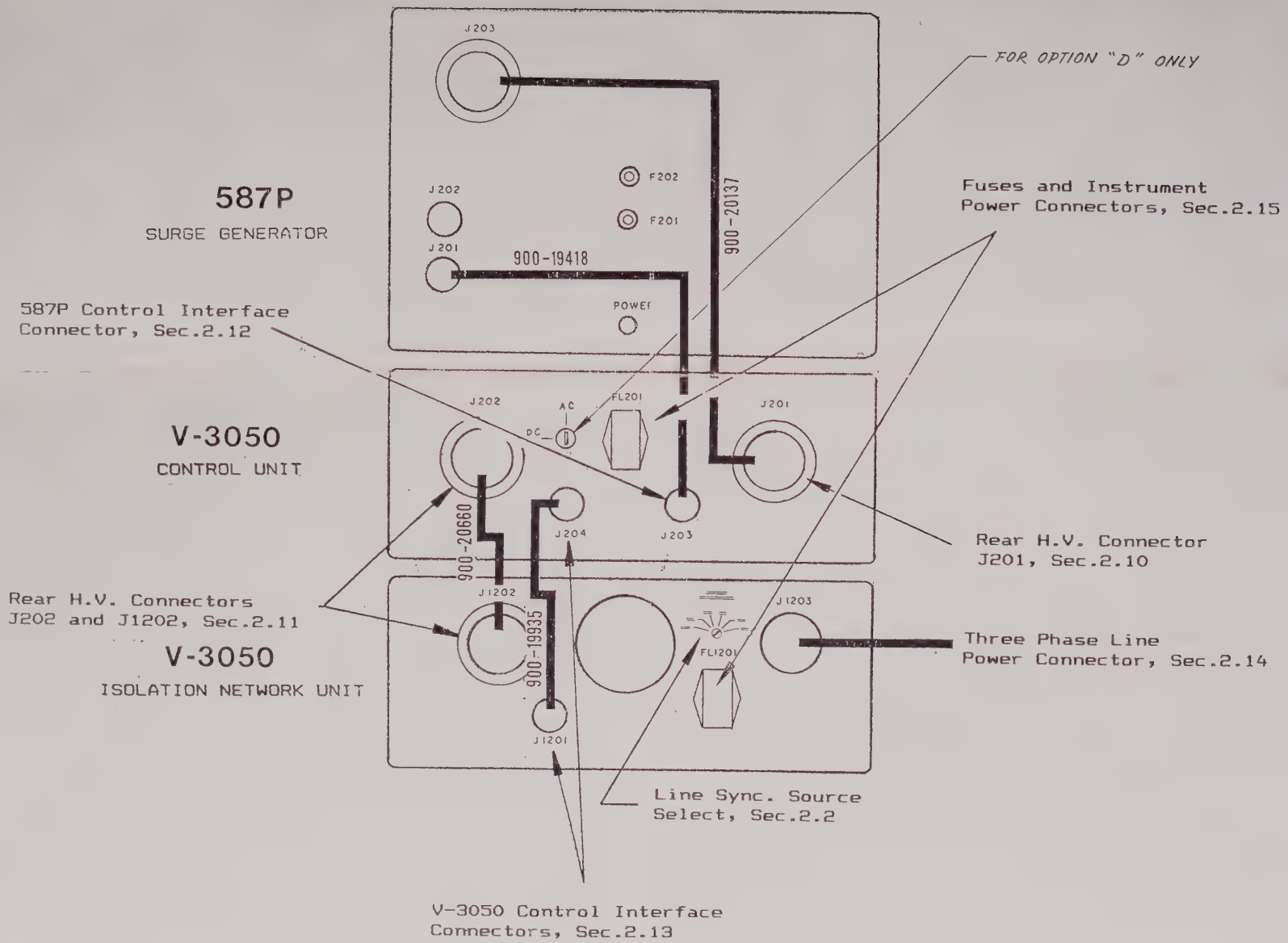
Circuit Designation:	Description:	Velonex Part No.
5.9 Relays:		
K301	5VDC, SPDT, 10W	132-0024
K901	24VDC, 4PDT, 2A	132-0021
K902-K903	RELAY	132-0069
K1201-K1202	115VAC, 3PST, 50A	132-0046
5.10 Switches:		
S101	Switch DPDT (Control Unit)	131-0001
S101A,B,C,D,E	Magnetic Circuit Breaker (Ntwrk)	270-0035
S102	Switch H.V. (polarity)	900-19617
S103-S104	Switch H.V. (surge injection)	900-19901
S201-S202	Interlock, H.V. Connector, SPDT	131-0101
S203-S204	Top and Bottom Cover Interlock	131-0006
S205	Switch 6P6T, 30 deg.	131-0073
S301-S302	Switch 1P5P	900-16579-1
S1701	Switch Thermal 185 deg.	131-0038
S1201-S1202	Top and Bottom Cover Interlock	131-0006
S1203	Switch, Interlock, Cavity	131-0006
S1204	Interlock, H.V. Connector, SPDT	131-0101
5.11 Inductors:		
L701-L704	Inductor, 25 Amp	900-2914-1
5.12 Miscellaneous:		
J203	Panel Mount 8-pin Female	150-0175
J204	Panel Mount 10-pin Male	150-0225
J1201	Panel Mount 10-pin Female	150-0215
J1203	Panel Connector, AC Power	150-0221

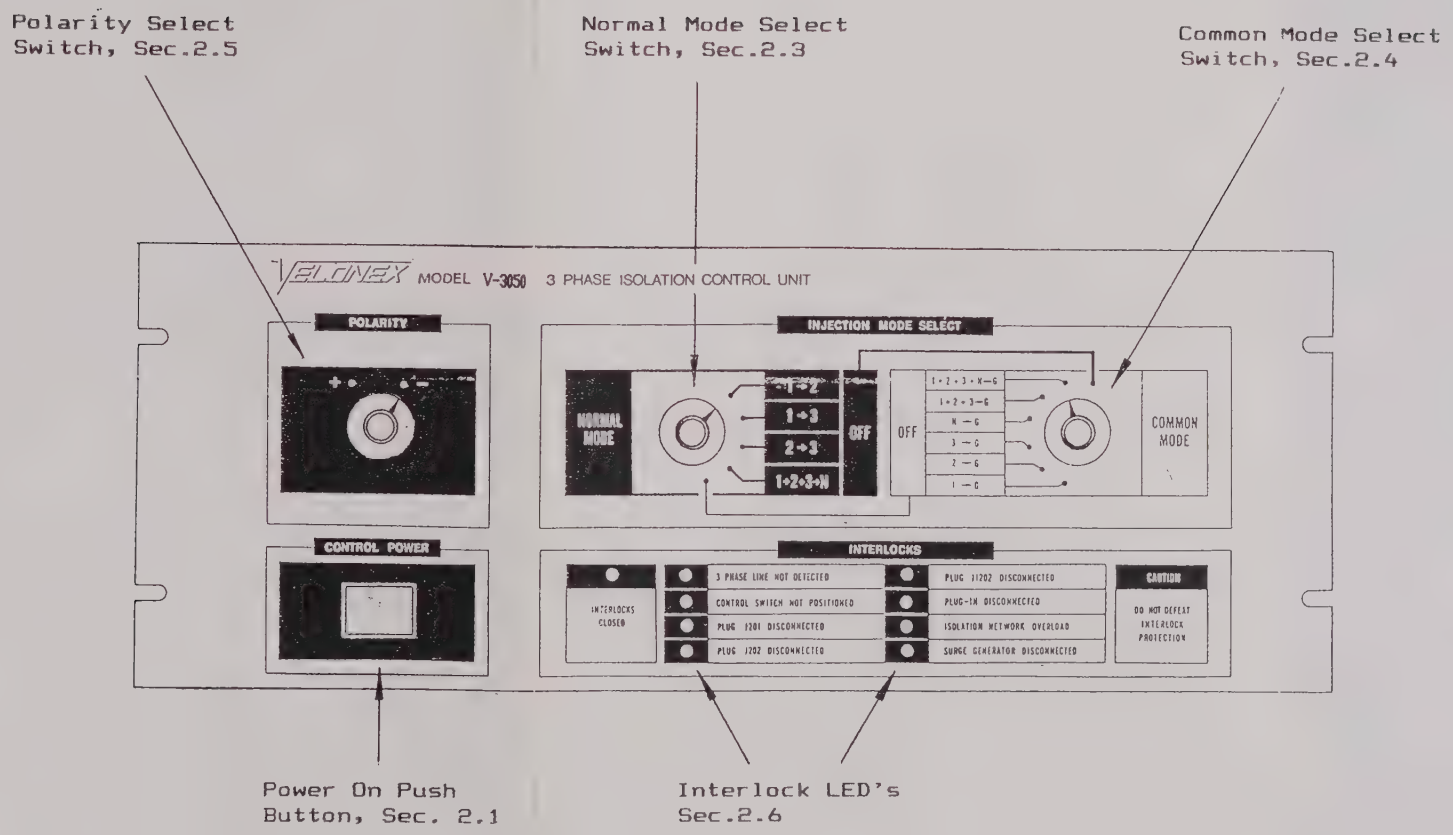
Replaceable Parts List (Cont)

Circuit Designation:	Description:	Velonex Part No.
P1203	277/480VAC 30A Power Input	150-0224
FL201	Line Power Receptacle Unit	150-0220
J1101-J1102	Connector, BNC	150-0001
J1101-J1104	25A, Red	150-0010
J1105	25A, Black	150-0009
FL1201	Line Power Receptacle Unit	150-0220
FL1502	250VAC, 5A, 50/60Hz	143-0001
B1201	115V, 4.5" Dia.	300-0005
	Power Cord, 110 VAC	053-0008
	Control,Cable 8-pin	900-19418
	High Voltage Cable	900-20137
	Control,Cable 10-pin	900-19935
	Cable	900-20660

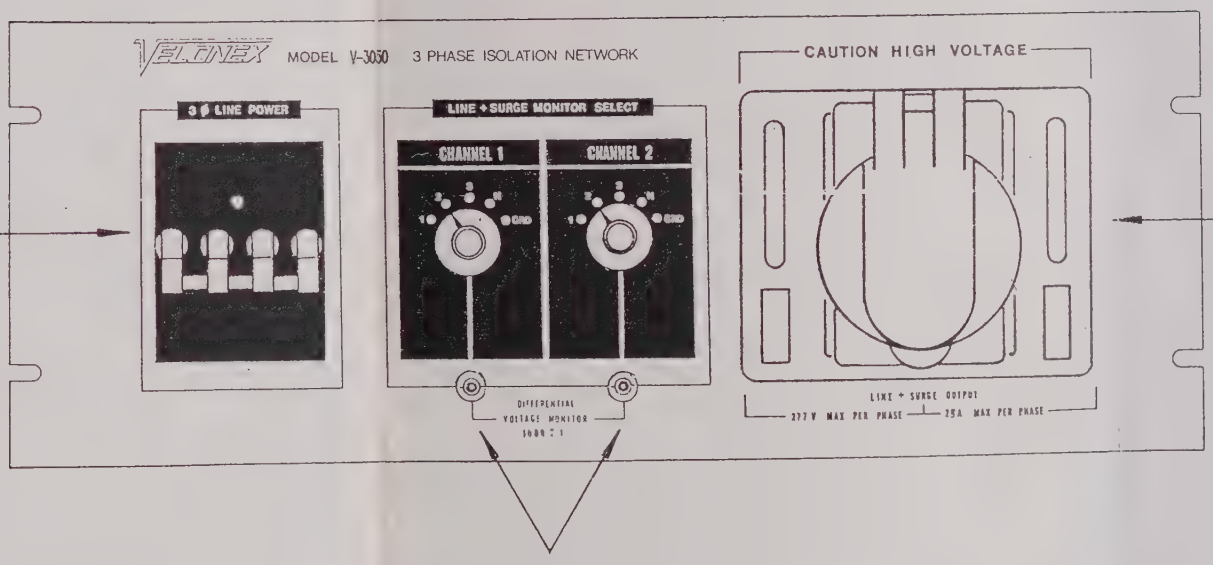


MODEL 587P& V-3050 RACK POSITIONS
FIGURE 6-1

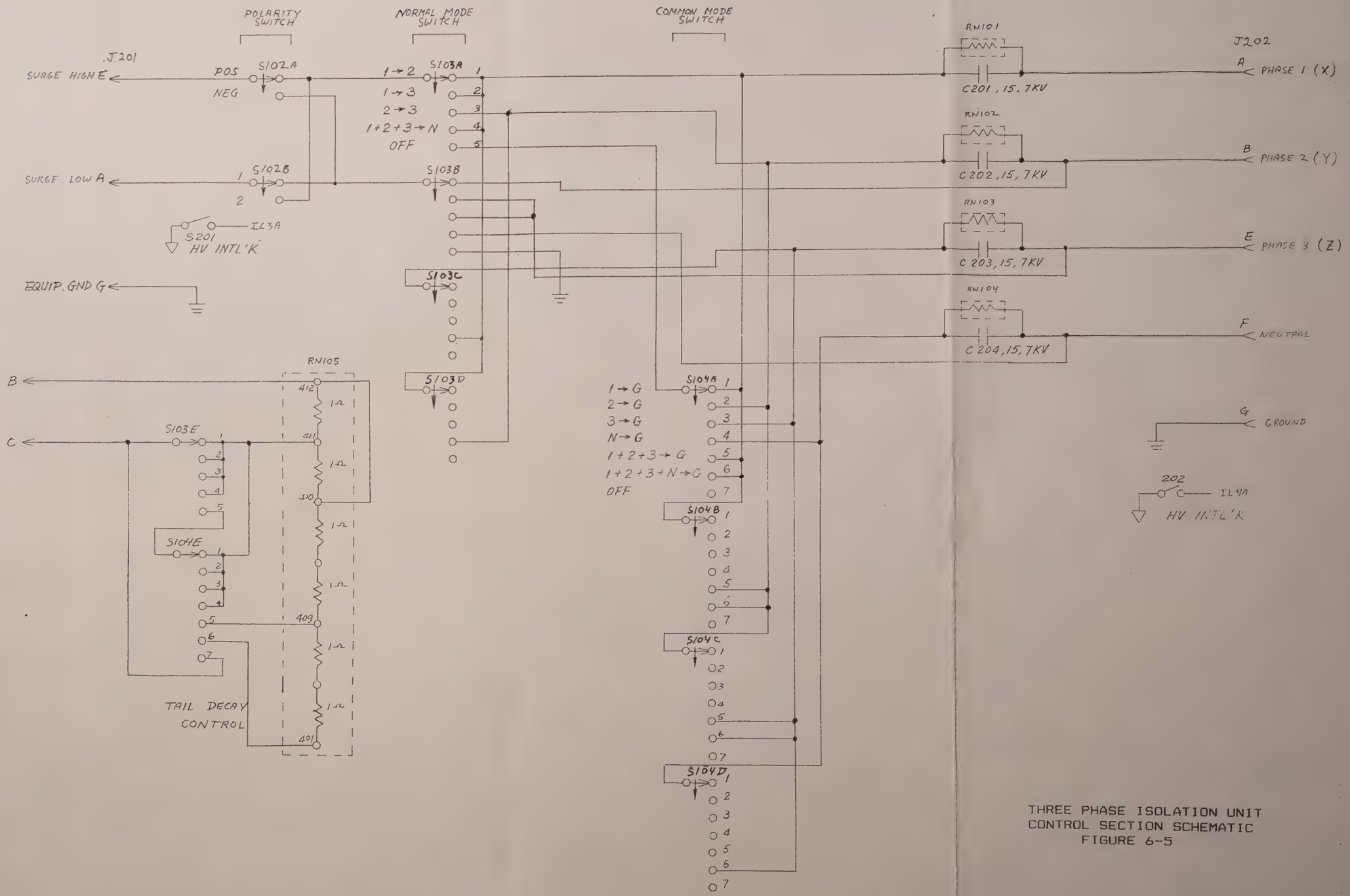

587P
SURGE GENERATOR
V-3050
CONTROL UNIT
V-3050
ISOLATION NETWORK UNIT
J203
J202
J201
F202
F201
POWER
900-19418
900-20137
FOR OPTION "D" ONLY
Fuses and Instrument
Power Connectors, Sec.2.15
587P Control Interface
Connector, Sec.2.12
AC
DC
FL201
900-20660
J204
Rear H.V. Connector
J201, Sec.2.10
Rear H.V. Connectors
J202 and J1202, Sec.2.11
J1202
900-19935
J1203
FL1201
Three Phase Line
Power Connector, Sec.2.14
J1201
Line Sync. Source
Select, Sec.2.2
V-3050 Control Interface
Connectors, Sec.2.13



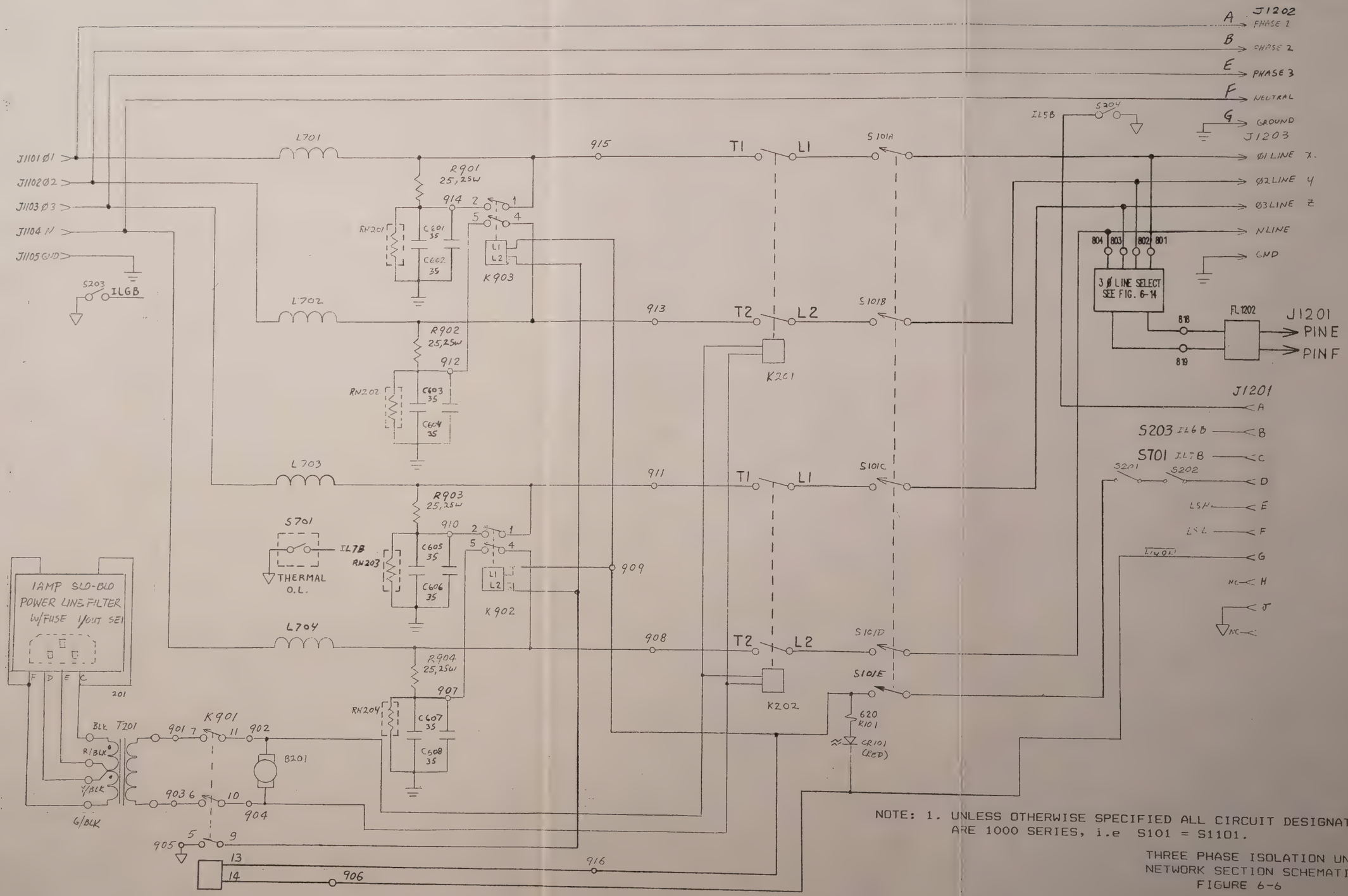
CONTROL UNIT FRONT PANEL
FIGURE 6-3



ISOLATION NETWORK FRONT
FIGURE 6-4

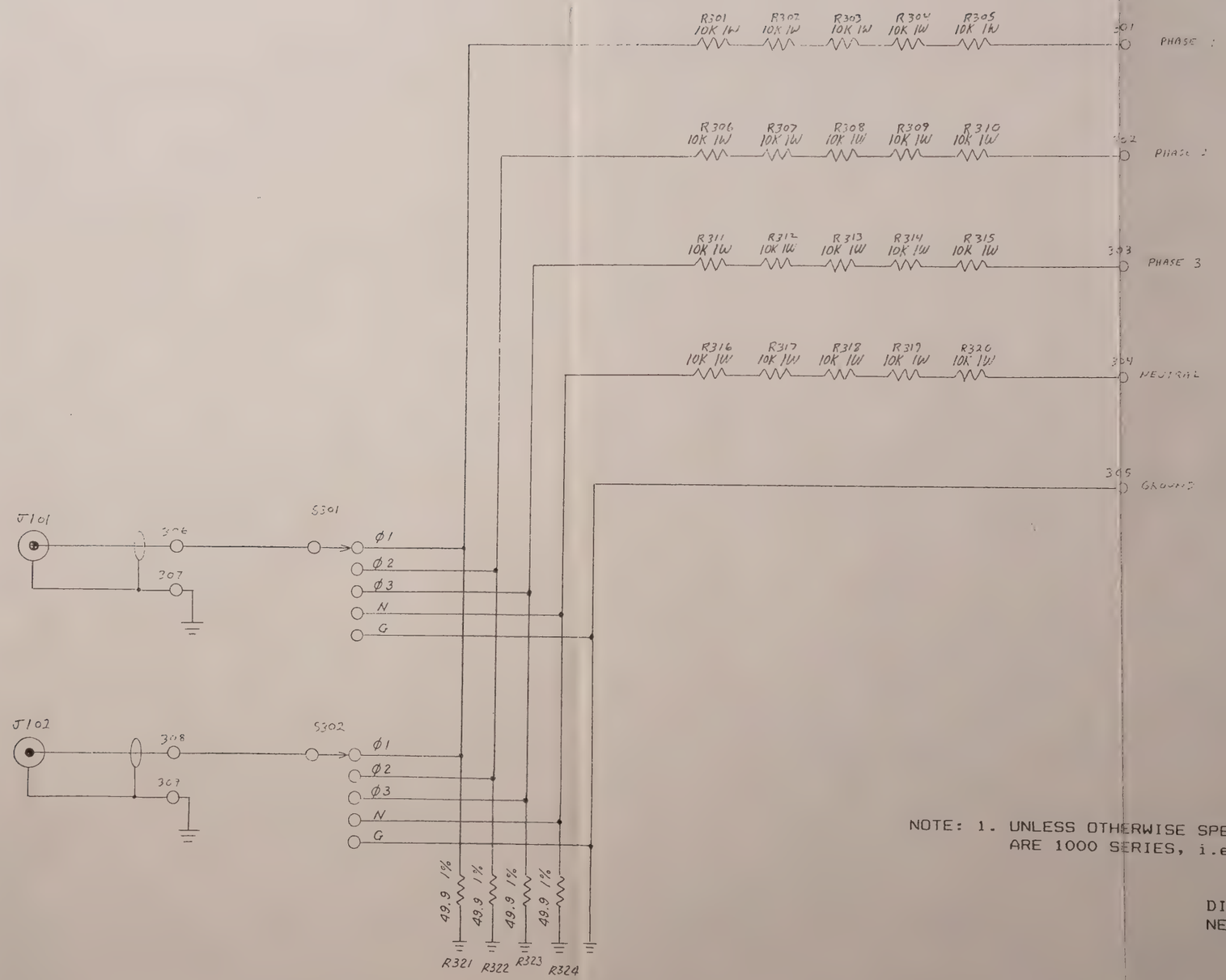


THREE PHASE ISOLATION UNIT
CONTROL SECTION SCHEMATIC
FIGURE 6-5



NOTE: 1. UNLESS OTHERWISE SPECIFIED ALL CIRCUIT DESIGNATION ARE 1000 SERIES, i.e S101 = S1101.

THREE PHASE ISOLATION UNIT
NETWORK SECTION SCHEMATIC
FIGURE 6-6



NOTE: 1. UNLESS OTHERWISE SPECIFIED ALL CIRCUIT DESIGNATIONS ARE 1000 SERIES, i.e S101 = S1101.

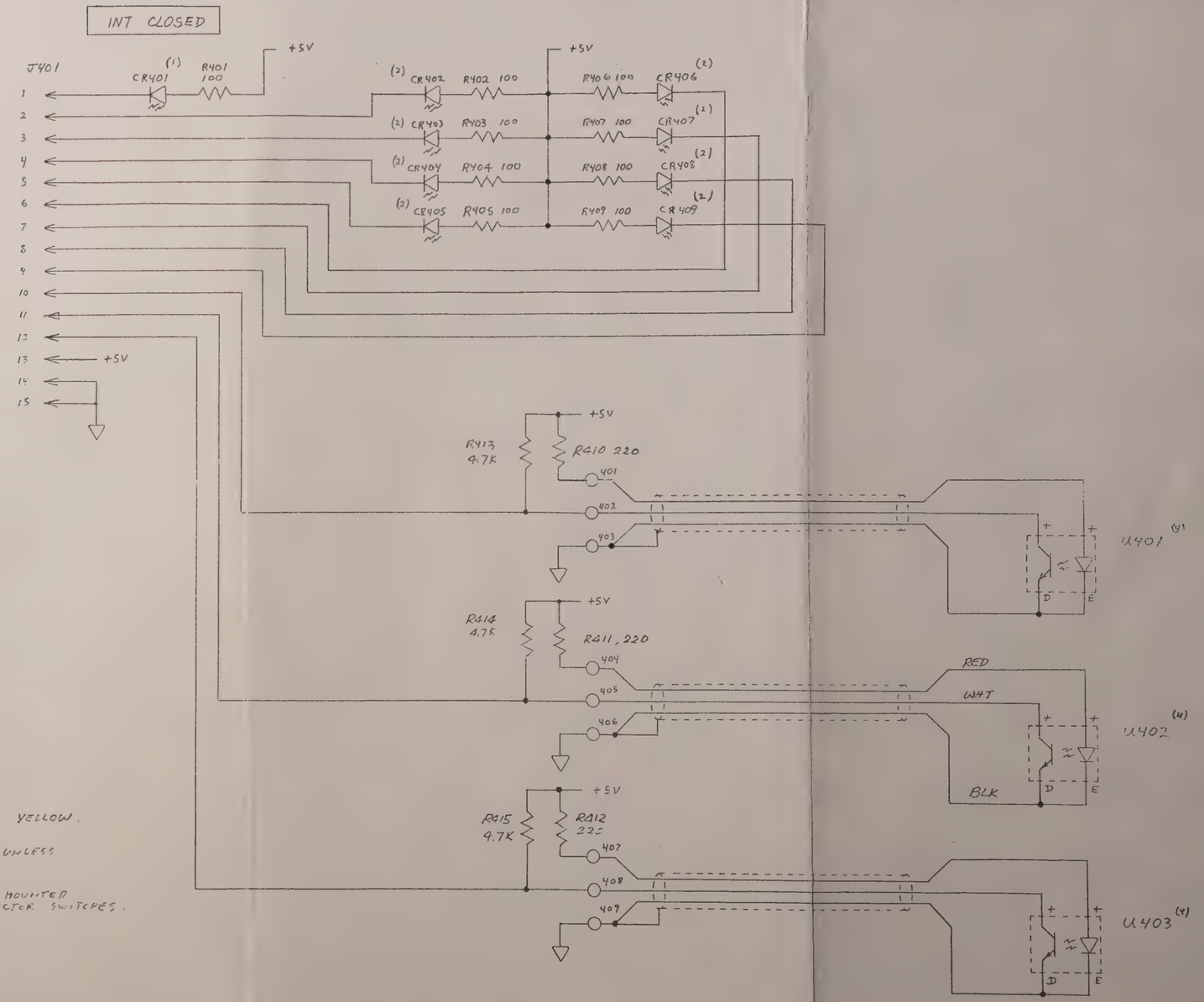
DIFFERENTIAL ATTENUATOR
NETWORK SECTION SCHEMATIC
FIGURE 6-7

IC#	TYPE	+5	GND
Z301	74HC20	14	7
Z302	74HC08	14	7
Z303	LM311	8	1
Z304	74HC04	14	7
Z305	74HC02	14	7
Z306	LM556	14	7
Z307	74HC32	14	7
Z308	74HC32	14	7

THREE PHASE ISOLATION UNIT
CONTROL SECTION LOGIC SCHEMATIC
FIGURE 6-8

3φ LINE NOT DET.
CONTROL SW. NOT POS.
PLUG J201 DISC
PLUG J202 DISC

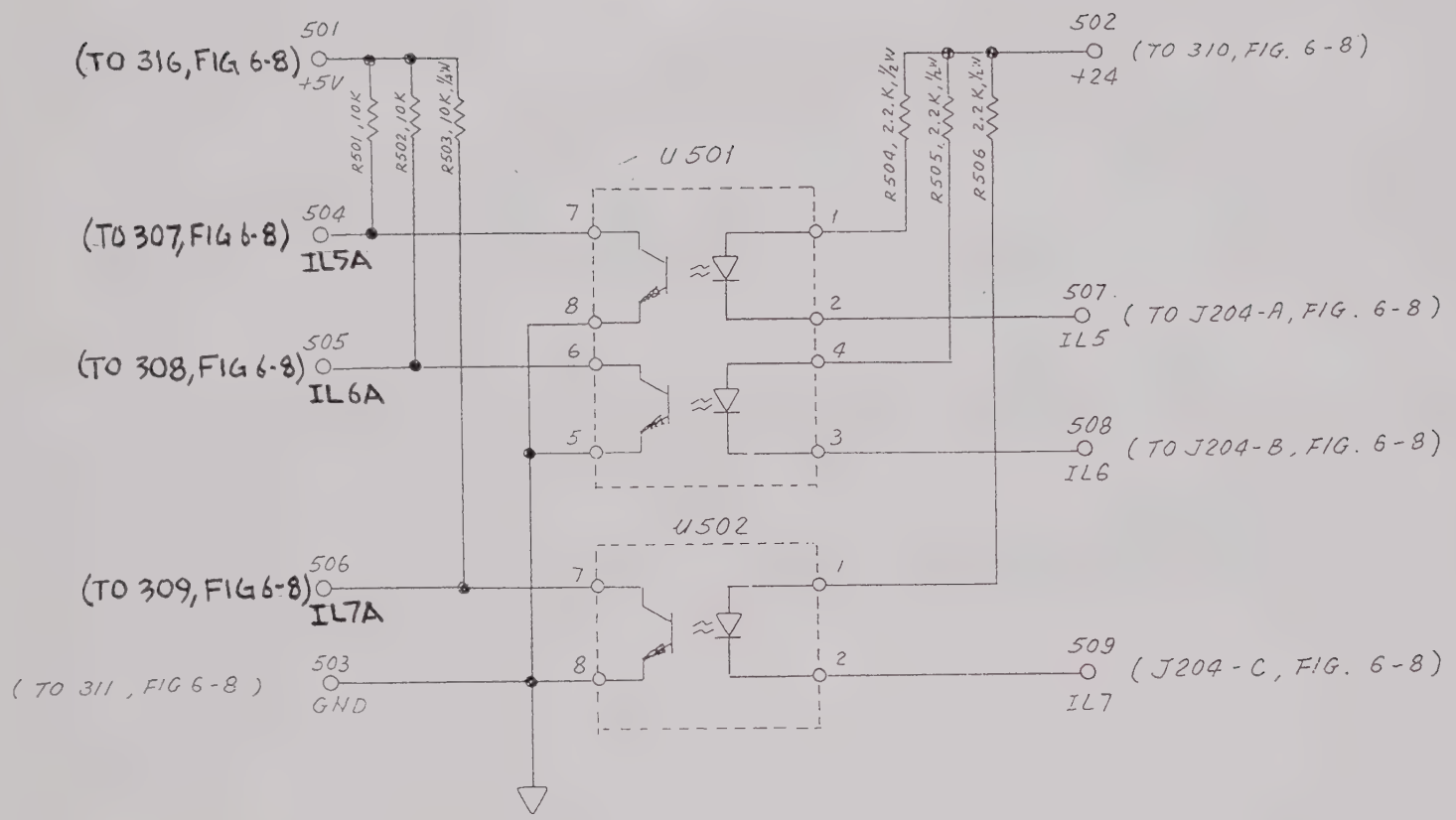
PLUG J1202 DISC
PLUG-IN DISC.
ISOLATION NETWORK OVERLOAD
SURGE GEN DISC



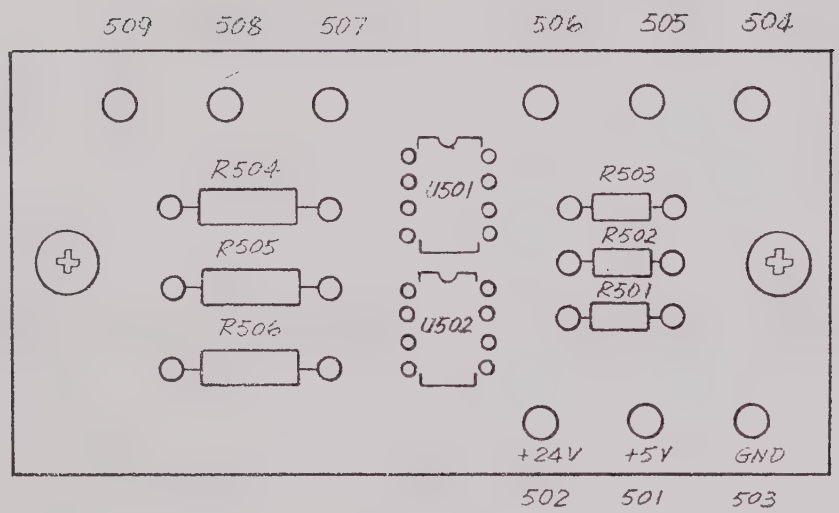
NOTES:

1. LED CR401 IS GREEN
2. LED'S CR402 — CR409 ARE YELLOW.
3. ALL RESISTORS ARE ¼ WATT UNLESS OTHERWISE SPECIFIED.
4. U401 — U403 OPTO SWITCHES MOUNTED ON POLARITY AND SURGE SELECTOR SWITCHES.

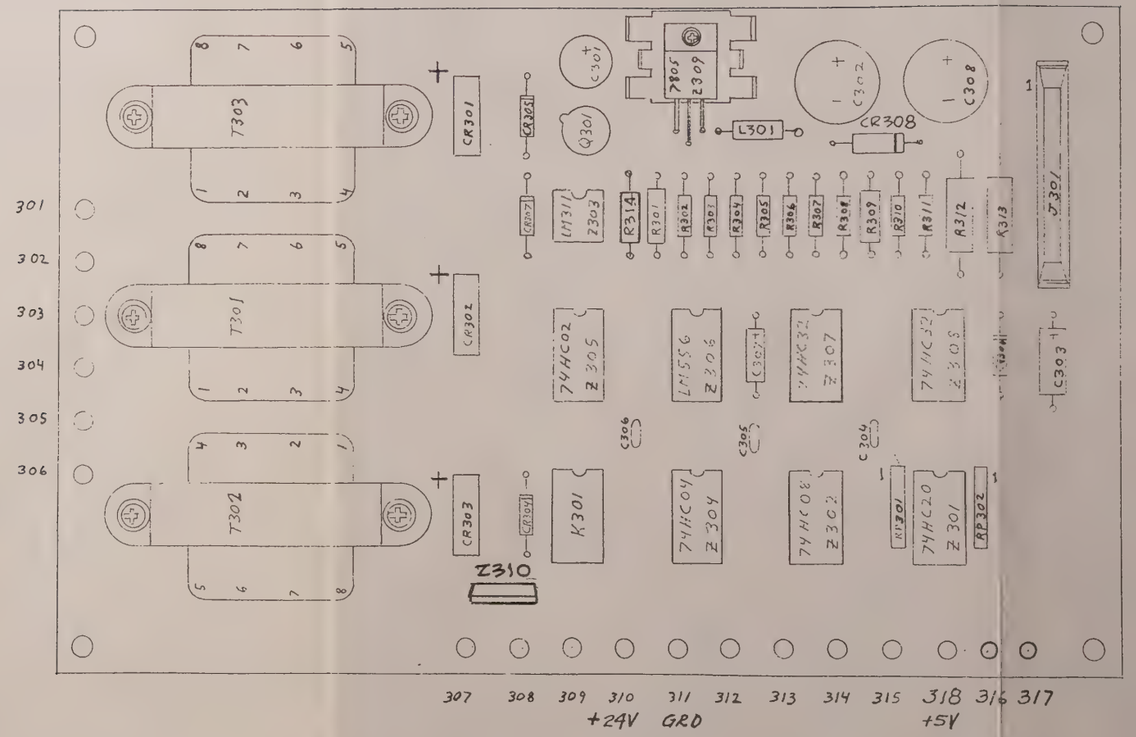
INTERLOCK DISPLAY
CONTROL UNIT SCHEMATIC
FIGURE 5-9



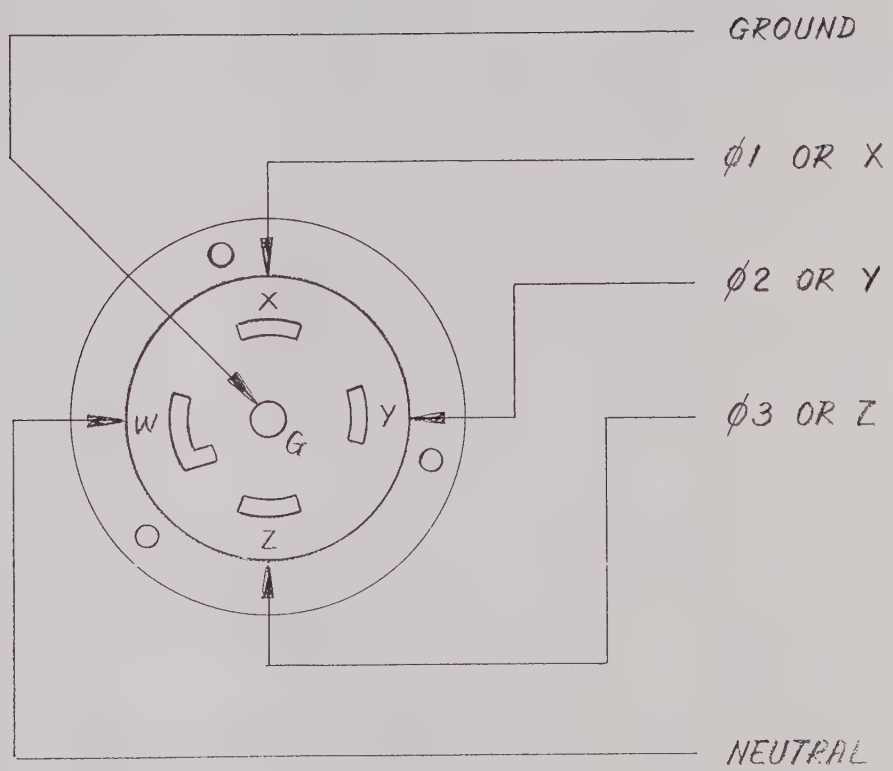
OPTO-COUPLER INTERFACE
CONTROL UNIT SCHEMATIC
FIGURE 6-10



OPTO COUPLER INTERFACE
COMPONENT LOCATION
FIGURE 6-11

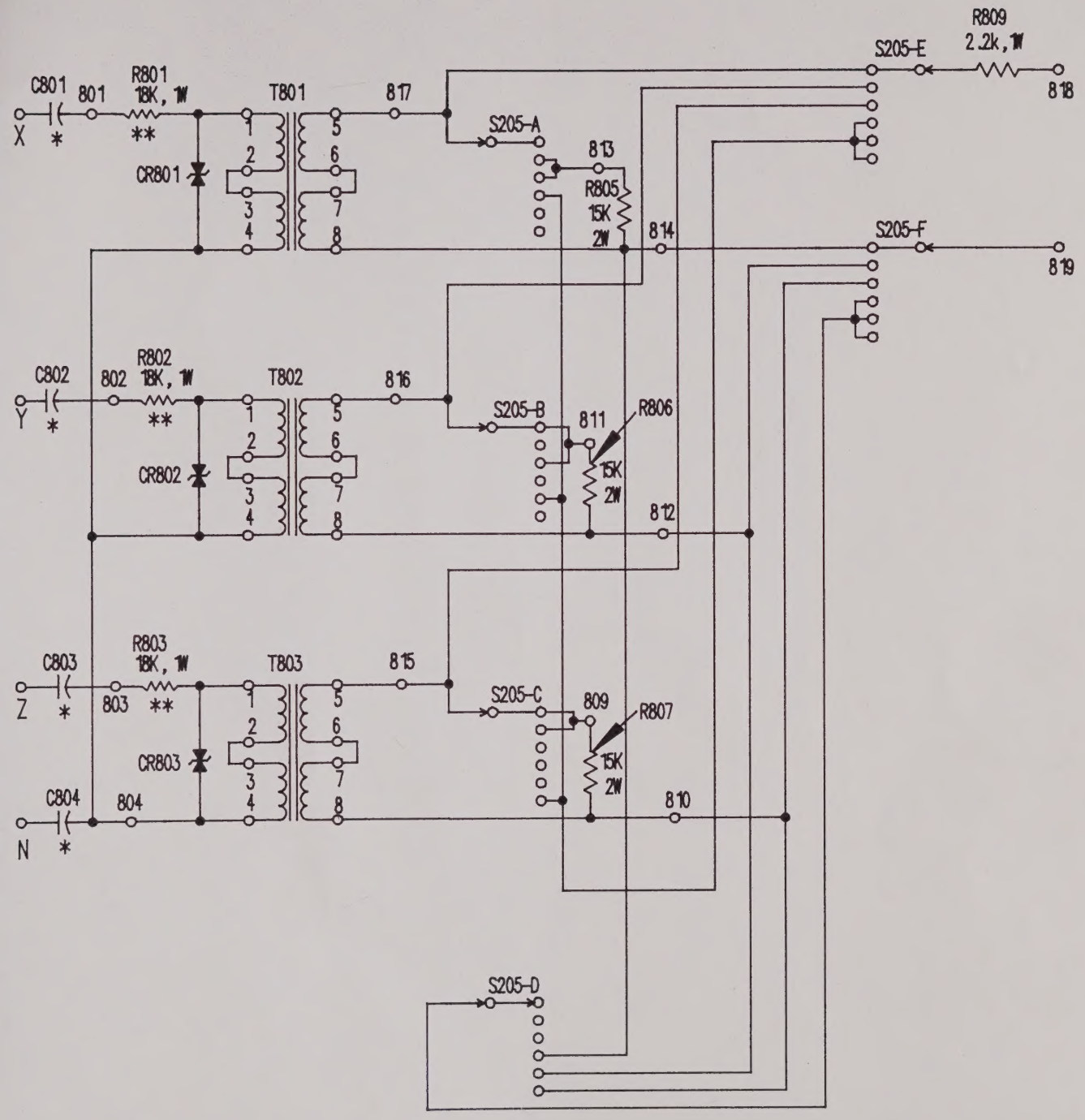


INTERLOCK CONTROL AND
DC POWER SUPPLIES
COMPONENT LOCATION
FIGURE 6-12



MATING SURFACE SHOWN

THREE PHASE EXT. LINE CORD POWER
CONNECTION CABLE RECEPTACLE J1204
FIGURE 6-13



* FOR OPTION "D" ONLY
** WHEN OPTION "D" APPLIED REPLACE R801-R803 WITH 6.8K

MODEL V-3050
3 PHASE LINE SYNC SOURCE SELECT
3 PHASE ISOLATION UNIT
FIGURE 6-14

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